CLAIMS

1. A method for determining an operating parameter of a chip having first and second ring oscillators, comprising:

measuring a frequency of the first ring oscillator;

measuring a frequency of the second ring oscillator; and

calculating an operating parameter of the chip as a function of the first and second ring oscillator frequencies.

2. The method of claim 1 wherein the measuring of the first ring oscillator frequency comprises:

obtaining two ring oscillator clock counts, separated by a time difference, from a ring oscillator;

obtaining two independent clock counts, separated by the time difference, from a clock output independent from the ring oscillator; and

calculating a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

3. The method of claim 2 wherein the calculated operating parameter comprises temperature.

4. The method of claim 2 wherein the calculated operating parameter comprises process speed.

5. The method of claim 3, further comprising:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's operating temperature.

6. The method of claim 4, further comprising:

dividing the measured frequency of the first ring oscillator frequency by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's process speed.

7. The method of claim 6, further comprising:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a second result;

determining, as a function of the second result and the characterization data, the chip's operating temperature; and

adjusting the determined process speed according to the determined operating temperature.

8. The method of claim 3, further comprising:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determining, from the comparison, the temperature of the chip.

9. The method of claim 4, further comprising:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determining, from the comparison, the process speed of the chip.

10. Computer-readable media embodying a program of instructions executable by a computer to perform a method of determining an operating parameter of a chip having first and second ring oscillators, the method comprising:

measuring a frequency of the first ring oscillator;

measuring a frequency of the second ring oscillator; and

calculating an operating parameter of the chip as a function of the first and second ring oscillator frequencies.

11. The computer-readable media of claim 10 wherein the measuring of the first ring oscillator frequency comprises:

obtaining two ring oscillator clock counts, separated by a time difference, from a ring oscillator;

obtaining two independent clock counts, separated by the time difference, from a clock output independent of the ring oscillator; and

calculating a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

12. The computer-readable media of claim 11 wherein the calculated parameter comprises temperature.

13. The computer-readable media of claim 11 wherein the calculated parameter comprises process speed.

14. The computer-readable media of claim 12 wherein the method further comprises:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's operating temperature.

15. The computer-readable media of claim 13 wherein the method further comprises:

dividing the measured frequency of the first ring oscillator frequency by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's process speed.

16. The computer-readable media of claim 15, wherein the method further comprises:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a second result;

determining, as a function of the second result and the characterization data, the chip's operating temperature; and

adjusting the determined process speed according to the determined operating temperature.

17. The computer-readable media of claim 12 wherein the method further comprises:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determining, from the comparison, the temperature of the chip.

18. The computer-readable media of claim 13 wherein the method further comprises:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determining, from the comparison, the process speed of the chip.

19. A system comprising:

a chip having first and second ring oscillators; and

a processor configured to:

measure a frequency of the first ring oscillator;

measure a frequency of the second ring oscillator; and

calculate an operating parameter of the chip as a function of the first and second ring oscillator frequencies.

20. The system of claim 19 wherein the chip comprises the processor.

21. The system of claim 19 wherein the processor is separate from but operably connected to the chip.

22. The system of claim 19 wherein the chip additionally comprises:

a first counter configured to obtain two ring oscillator clock counts, separated by a time difference, from the first ring oscillator;

a second counter configured to obtain two independent clock counts, separated by the time difference, from a clock output independent of the first and second ring oscillators; and

wherein the processor is further configured to calculate a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

23. The system of claim 22 wherein the calculated parameter comprises temperature.

24. The system of claim 22 wherein the calculated parameter comprises process speed.

25. The system of claim 23 wherein the processor is additionally configured to:

multiply the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determine, as a function of the result and characterization data of the chip, the chip's operating temperature.

26. The system of claim 24 wherein the processor is additionally configured to:

divide the measured frequency of the first ring oscillator frequency by the measured frequency of the second ring oscillator to obtain a result; and

determine, as a function of the result and characterization data of the chip, the chip's process speed.

27. The system of claim 26, wherein the processor is further configured to:

multiply the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a second result;

determine, as a function of the second result and the characterization data, the chip's operating temperature; and

adjust the determined process speed according to the determined operating temperature.

28. The system of claim 23 wherein the processor is further configured to:

calculate a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

compare the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determine, from the comparison, the temperature of the chip.

29. The system of claim 24 wherein the processor is further configured to:

calculate a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

compare the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determine, from the comparison, the process speed of the chip.

30. An processor comprising:

means for measuring a frequency of a first ring oscillator;

means for measuring a frequency of the second ring oscillator; and

means for calculating an operating parameter of a chip as a function of the first and second ring oscillator frequencies.

31. The apparatus of claim 30 wherein the calculated parameter comprises temperature.

32. The apparatus of claim 30 wherein the calculated parameter comprises process speed.